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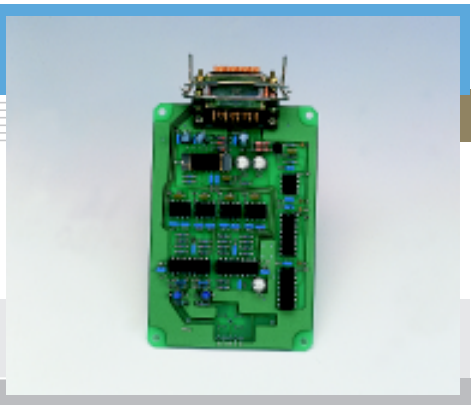
Signal processing circuit for 1-D PSD
C5923

Circuit board for easier 1-D PSD operation



Features

- No complicated adjustments required
  Position can be measured just by installing a 1-D PSD on the board.
- Accurate position sensing
  Use of pulse-driven LED allows accurate position sensing even under background light, and independent of pulsed light intensity.
- Compact design
  An LED drive circuit, head amp, signal addition/subtraction circuits, sample hold circuit, synchronization circuit and analog divider circuit are mounted on a compact PC board.

Applications

- Displacement measurements using pulsed light synchronized with the circuit
- Various studies using 1-D PSD
- Performance evaluation of 1-D PSD

■ Absolute maximum ratings

Parameter		Symbol	Value	Unit
Signal processor	Supply voltage	Vcc Max.	±18	V
	Input signal current	IIN Max.	Vcc Max. × 10^{-5}	A
	Output short-circuit time	-	Continuous	s
	Operating temperature	Topr	0 to +50	°C
LED driver	Transistor collector-emitter voltage	VCE	+30	V
	Transistor collector current *1	Ic	800	mA
	Transistor collector dissipation *1	Pc	600	mW

■ Recommended operating range

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	Vcc		±14.5	±15	±15.5	V

■ Specifications / characteristics (Ta=25 °C, Vcc=±15 V)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Signal processor	Head amp conversion impedance *2	Rf	Factory setup prior to shipping	0.95 × 10^5	1 × 10^5	1.05 × 10^5	V/A
	Feedback capacitance *2	Cf	Factory setup prior to shipping	21	22	23	pF
	Input signal current *3	IIN	Photocurrent with PSD installed	1 × 10^{-5}	-	1 × 10^{-4}	A
	Rise time (output 10 to 90 %)	tr	Output response time versus movement of light spot position, measured with PSD installed.	30	-	-	µs
	PSD reverse voltage	VR	Factory setup prior to shipping	0	5	14	V
	Output offset voltage	Vos	*5	-10	-	+10	mV
	Output voltage amplitude *4	Vo	With PSD installed and light spot falling on edge of active area.	-10	-	+10	V
	Output noise (analog divider)	Vn	All range *5	5	10	50	mVp-p
	Current consumption	Icc	*5	-	±45	-	mA
LED driver	Transistor collector current	Ic	*1	-	170	-	mAp-p
	Repetition frequency	fT	*1	-	3333	-	Hz
	Output method	-	-	Open collector			-

*1: Duty ratio: 3/10, pulse width: 90 µs, LED: L1915-01 (made by Hamamatsu; sold separately)
*2: These resistors are lead types and inserted into sockets, so it can be easily to exchange by the user if necessary in a range between 1 × 10^4 to 1 × 10^6 Ω. For more details, see the instruction manual that comes with the product.
*3: PSD does not operate correctly if the input signal current is outside the specified range.
*4: Maximum output amplitude can be adjusted in a range of ±2 to ±10 V according to PSD type to be used.
*5: With no PSD installed and LED turned off; pulsed current of 20 µA (X1=X2) is supplied to the circuit as current signal (duty ratio: 3/10, pulse width: 90 µs) that substitutes for PSD photocurrent

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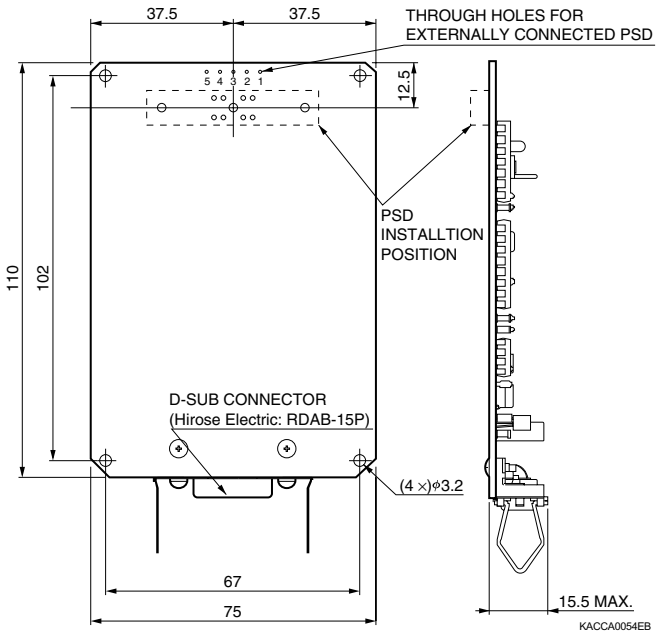
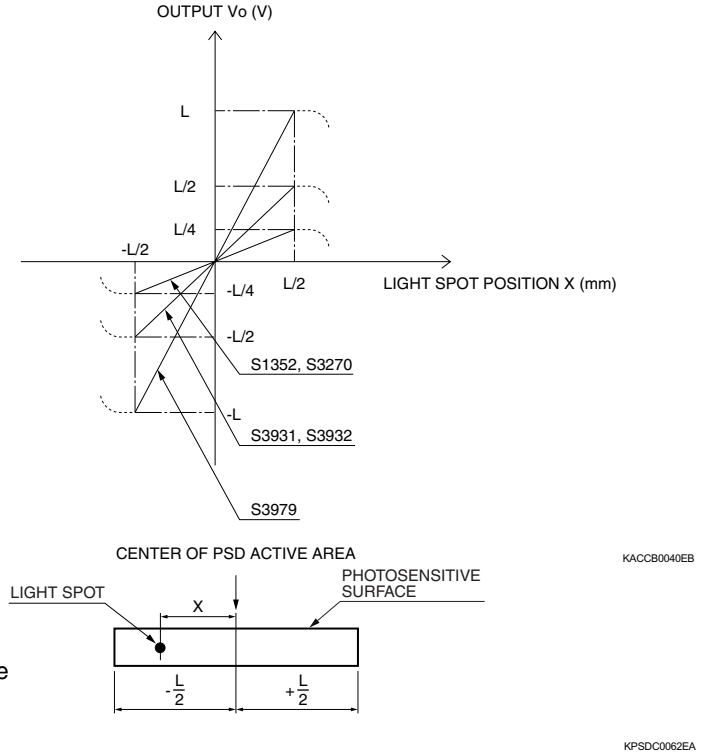
■ Dimensional outline (unit: mm, tolerance: ±0.2 mm)



S1352, S3931 and S3932 (PSD made by Hamamatsu) can be directly mounted on the board. To mount other types of 1-D PSDs, use through holes on the board.

■ PSD and output voltage



■ Input/output terminals

● D-sub connector

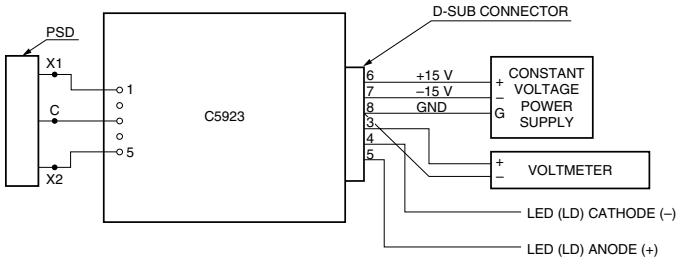
Terminal No.	Name	Content
1	VREF	Reference voltage monitor output
2	VR	PSD bias voltage monitor output
3	Vo	Divider output (position-converted voltage)
4	K	Connection to LED or other cathode
5	A	Connection to LED or other anode
6	+V	+15 V input
7	-V	-15 V input
8	G	GND
9	V1	Head amp output 1
10	V2	Head amp output 2
11	V3	Subtracted signal pulse output
12	V4	Summed signal pulse output
13	V5	Subtracted signal output after S/H *
14	V6	Summed signal output after S/H *
15	G	GND

* S/H: sample hold

● Through holes for externally connected PSD

Terminal No.	Name	Content
1	IN1	Input from PSD output 1
2	G	GND
3	VR	Bias voltage output for connection to PSD cathode
4	G	GND
5	IN2	Input from PSD output 2

■ Operating example



Measurement conditions
1. Light source: LED (λp=900 nm)
2. Light spot: φ200 μm
3. PSD: S1352 (L=34 mm)
4. PSD photocurrent: 10 μA
5. Frequency bandwidth: 10 Hz
6. Voltmeter: 195A (KEITHLEY)
7. Constant voltage power supply: ±15 V, power supply capacity: 0.2 A or more, ripple voltage: 3 mVp-p or less

When measured under the above conditions, the following output voltage amplitude and position resolution can be obtained.
· Output voltage amplitude: V_{FS}=±10 V
· Position resolution: Δl=approx. 0.6 μm (calculated value)

■ Accessories

· Connector HDAB-15S (HIROSE: For connections to power supply and output readout device)

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